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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/671,100

09/25/2003

Martin Howlid

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09/22/2006

WESTERNGECO L.L.C.
10001 RICHMOND AVENUE
(P.O. BOX 2469, HOUSTON, TX 77252-2469, U.S.A.)
HOUSTON, TX 77042

EXAMINER

HUGHES, SCOTT A

ART UNIT

PAPER NUMBER

3663

DATE MAILED: 09/22/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/671,100

Applicant(s)

HOWLID ET AL.

Examiner

Scott A Hughes

Art Unit

3663

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 30 June 2006.
- 2a) ☒ This action is FINAL. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-5, 7, 9, 11, 13, 14, 16, 18 and 20-33 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-5, 7, 9, 11, 13, 14, 16, 18 and 20-33 is/are rejected.
- 7) ☒ Claim(s) 1, 20 and 24 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 26 January 2004 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☒ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Response to Arguments

Applicant's arguments with respect to claims 1-5, 7, 9, 11, 13-14, 16, 18, and 20-33 have been considered but are moot in view of the new ground(s) of rejection.

Applicant argues that the Ray reference fails to teach or suggest deploying seismic receivers directly above one another. Applicant further argues that Ray does not teach or suggest processing the acquired seismic data to attenuate the effect of ghost reflections. The Ray reference was used with the Robertsson reference to reject the claims, and the Robertsson reference was relied upon for the teaching of processing seismic data to attenuate the effect of ghost reflections. Applicant argues that the Robertsson reference does not teach deploying receivers at different depths. Applicant argues that Robertsson fails to teach deploying seismic receivers directly above one another. This argument is not persuasive as the Robertsson reference teaches receivers directly above one another in Figs. 6d and 6e and discussed on pages 14-15 and 18-19 in the discussion of twin over/under streamers.

Drawings

The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the at least two receivers, with at least one receiver being deployed directly above at least one other receiver must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Objections

Claims 1, 20 and 24 are objected to because of the following informalities: The amended portion of the claims recite the limitation "the seismic source being configured to provide at least two seismic signals" when this limitation should read "the seismic source array being configured to" since it is the array and not an individual source that provide the signals. Appropriate correction is required.

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 1-5, 7, 9, 11, 13-14, 16, 18, and 20-33 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

The independent claims contain the limitation of at least two seismic receivers, with at least one receiver being deployed directly above at least one other receiver. This limitation was added by amendment to each of the independent claims, and the applicant did not specifically point out where support for this limitation can be found in the specification. After searching the specification, the closest paragraph for support for the newly added limitation was one Page 17, the first full paragraph (Paragraph 72 of the PG Pub). This paragraph states, "for example, the receivers may be arranged in two arrays, one array below the other." This disclosure in the specification of two arrays with one below the other is broader than the limitation of one receiver directly above another. Having two source arrays, with one below the other does not mean that there will be two receivers, with one being directly above another. The arrays could be offset horizontally from each other or offset along the axes of the arrays and still be one below the other. Further, the individual receivers in two arrays with one above the other are

not necessarily aligned with one directly above the other as claimed. The receivers could be offset by a distance along the axis of each array. There is no support in the disclosure for the specific limitation of at least one receiver being deployed directly above at least one other receiver that was added to the claims.

Independent claim 20 includes the new limitation of a controller being coupled to the seismic source array and the at least two receivers. This limitation was added by amendment to independent claim 20, and the applicant did not specifically point out where support for this limitation can be found in the specification. There was no support found in the specification for a controller coupled to both the source array and the seismic receivers.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-5, 7, 9, 11, 13-14, 20-29, and 32-33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ray (4493061) in view of Robertsson (WO0057207).

With regard to claim 1, Ray discloses a method of processing seismic data (Column 4, Lines 5-31; Column 5). Ray discloses acquiring seismic data using a

seismic source array comprising at least two sources S1-S3, at least one seismic source being deployed directly above at least one other seismic source (Fig. 2) (Column 5, Line 59 to Column 7, Line 56), the seismic source array being configured to provide at least two seismic signals having frequency spectra within the seismic bandwidth that contain a source ghost at a non-zero frequency, said at least two seismic signals combining to form a seismic wavefield having a frequency spectrum within the seismic bandwidth that does not contain a source ghost at a non-zero frequency (Column 3, Line 30 to Column 4, Line 31; Column 7, Lines 15-45). Ray does not disclose the specifics of the receivers used to receive the waves. Ray does not disclose processing the acquired seismic data thereby to attenuate the effect of ghost reflections in the seismic data. Ray does not disclose the specifics of the data processing of the marine seismic survey. Robertsson teaches acquiring marine seismic data using at least two receivers, with at least one receiver being deployed directly above at least one other receiver (Figs. 6d, 6e) (Page 14, Line 25 to Page 15, Line 21; Page 18, Line 30 to Page 19, Line 30). Robertsson teaches that seismic data received with one or more receivers in marine seismic surveys using a streamer is de-ghosted during processing (abstract; Page 1, Lines 1-20; Page 3; Page 6, Line 10 to Page 7, Line 2; Page 9, Lines 1-8; Page 14, Lines 1-20; Pages 15-16; Page 19, Line 28 to Page 20) (Figs. 6a-f). It would have been obvious to modify Ray to include de-ghosting the seismic data received at two streamers deploying receivers directly above one another as taught by Robertsson in order to remove the ghost reflections which obscure the desired signals recorded at the streamer that are used in the seismic survey.

With regard to claim 2, Ray discloses providing a seismic wavefield having a frequency spectrum that does not contain a source ghost at non-zero frequency in the frequency range up to 500Hz, for a take-off angle of up to 45 degrees (Columns 5, 7-8) (Figs 1-2).

With regard to claim 3, Robertsson discloses processing the seismic data to attenuate the effects of receiver-side ghost reflections (Figs. 6a-f) (Pages 9, 14).

With regard to claim 4, Robertsson disclose a method of de-ghosting involving separating the data into up-going and down-going constituents (abstract; Pages 1, 6).

With regard to claim 5, Ray discloses a method of acquiring seismic data. Ray discloses providing at least two seismic signals having frequency spectra within the seismic bandwidth that contain a source ghost at a non-zero frequency, said at least two signals combining to form seismic energy having a frequency spectrum that does not contain a source ghost notch at a non-zero frequency within the seismic bandwidth (Column 3, Line 30 to Column 4, Line 31; Column 7, Lines 15-45). Ray discloses that the at least two signals are provided by at least two seismic sources, at least one seismic source being deployed directly above at least one other seismic source S1-S3 (Fig. 2) (Column 5, Line 59 to Column 7, Line 56). Ray discloses acquiring seismic data in response to providing the at least two signals (Column 5), but does not disclose that this is done using at least two receivers with at least one receiver being deployed directly above at least one other receiver. Ray does not disclose processing the acquired seismic data thereby to attenuate the effect of ghost reflections in the seismic data. Ray does not disclose the specifics of the data processing of the marine seismic

survey. Robertsson teaches acquiring marine seismic data using at least two receivers, with at least one receiver being deployed directly above at least one other receiver (Figs. 6d, 6e) (Page 14, Line 25 to Page 15, Line 21; Page 18, Line 30 to Page 19, Line 30). Robertsson teaches that seismic data received with one or more receivers in marine seismic surveys using a streamer is de-ghosted during processing (abstract; Page 1, Lines 1-20; Page 3; Page 6, Line 10 to Page 7, Line 2; Page 9, Lines 1-8; Page 14, Lines 1-20; Pages 15-16; Page 19, Line 28 to Page 20) (Figs. 6a-f). It would have been obvious to modify Ray to include de-ghosting the seismic data received at two seismic streamers with one receiver directly above at least one other receiver as taught by Robertsson in order to remove the ghost reflections which obscure the desired signals recorded at the streamer that are used in the seismic survey.

With regard to claims 7, Ray discloses that providing the at least two seismic signals comprises providing the at least two seismic signals from at least two different locations (Column 4, Lines 5-31; Column 7, Lines 15-45) (Figs. 2, 5-7).

With regard to claim 9, Ray discloses that providing the at least two seismic signals comprises providing the at least two seismic signals from a first location and a second location disposed, in use, vertically below the first location (Column 4, Lines 5-31; Column 5, Lines 59-65; Column 7, Lines 15-45) (Figs. 2, 5-7).

With regard to claim 11, Ray discloses that providing the at least two seismic signals comprises providing at least one first seismic signal a predetermined time after providing at least one second seismic signal (Column 7).

With regard to claim 13, Ray discloses that the predetermined time is substantially equal to the travel time of seismic energy from the first location to the second location (Column 7).

With regard to claim 14, Ray discloses that providing the at least two seismic signals comprises providing at least one seismic signal from a location substantially at the surface of a water column (Fig. 2) (Column 5, Lines 59-65).

With regard to claim 20, Ray discloses an apparatus for processing seismic data acquired using a seismic source comprising at least two sources S1-S3, at least one seismic source being deployed directly above at least one other seismic source (Fig. 2) (Column 5, Line 59 to Column 7, Line 56), the source being array configured to provide at least two seismic signals having frequency spectra within the seismic bandwidth that contain a source ghost at a non-zero frequency, the at least two seismic signals combining to form a seismic wavefield having a frequency spectrum that does not contain a notch at a non-zero frequency (Column 4, Lines 5-31; Column 7, Lines 15-45). Ray does not disclose the apparatus comprising a means for processing the acquired seismic data thereby to attenuate the effect of ghost reflections in the seismic data. Ray discloses acquiring seismic data in response to providing the at least two signals (Column 5). Ray does not disclose the specifics of the receivers used to receive the waves. Ray does not disclose processing the acquired seismic data thereby to attenuate the effect of ghost reflections in the seismic data. Ray does not disclose the specifics of the data processing of the marine seismic survey. Robertsson teaches acquiring marine seismic data using at least two receivers, with at least one receiver

being deployed directly above at least one other receiver (Figs. 6d, 6e) (Page 14, Line 25 to Page 15, Line 21; Page 18, Line 30 to Page 19, Line 30). Robertsson teaches that seismic data received with one or more receivers in marine seismic surveys using a streamer is de-ghosted during processing (abstract; Page 1, Lines 1-20; Page 3; Page 6, Line 10 to Page 7, Line 2; Page 9, Lines 1-8; Page 14, Lines 1-20; Pages 15-16; Page 19, Line 28 to Page 20) (Figs. 6a-f). Robertsson teaches using a controller coupled to a source array and the receivers for receiving the acquired seismic data and for processing the data (Pages 15-20) (Figs. 8-9). It would have been obvious to modify Ray to include de-ghosting the seismic data received at two streamers deploying receivers directly above one another using a controller as taught by Robertsson in order to remove the ghost reflections which obscure the desired signals recorded at the streamer that are used in the seismic survey.

With regard to claim 21, Robertsson discloses processing seismic data to attenuate the effects of receiver-side ghost reflections (Figs. 6a-f) (Pages 9, 14).

With regard to claim 22, Robertsson disclose a method of de-ghosting involving separating the data into up-going and down-going constituents (abstract; Pages 1, 6).

With regard to claim 23, Robertsson discloses a programmable data processor (Page 16).

With regard to claim 24, Ray discloses a seismic surveying arrangement. Ray discloses a seismic source array comprising at least two sources S1-S3, at least one seismic source being deployed directly above at least one other seismic source (Fig. 2) (Column 5, Line 59 to Column 7, Line 56), the seismic source array being configured to

provide at least two seismic signals having frequency spectra within the seismic bandwidth that contain a source ghost at a non-zero frequency, the at least two seismic signals combining to form a seismic wavefield having a frequency spectrum that does not contain a notch at a non-zero frequency (Column 4, Lines 5-31; Column 7, Lines 15-45). Ray does not disclose at least two seismic receivers with at least one deployed directly above at least other for acquiring seismic data and an apparatus for processing seismic data acquired by the receivers. Ray discloses acquiring seismic data using receivers in response to providing the at least two signals (Column 5). Ray does not disclose processing the acquired seismic data thereby to attenuate the effect of ghost reflections in the seismic data. Ray does not disclose the specifics of the data processing of the marine seismic survey. Robertsson teaches acquiring marine seismic data using at least two receivers, with at least one receiver being deployed directly above at least one other receiver (Figs. 6d, 6e) (Page 14, Line 25 to Page 15, Line 21; Page 18, Line 30 to Page 19, Line 30). Robertsson teaches that seismic data received with one or more receivers in marine seismic surveys using a streamer is de-ghosted during processing (abstract; Page 1, Lines 1-20; Page 3; Page 6, Line 10 to Page 7, Line 2; Page 9, Lines 1-8; Page 14, Lines 1-20; Pages 15-16; Page 19, Line 28 to Page 20) (Figs. 6a-f). It would have been obvious to modify Ray to include de-ghosting the seismic data received at two seismic streamers with one receiver directly above at least one other receiver as taught by Robertsson in order to remove the ghost reflections which obscure the desired signals recorded at the streamer that are used in the seismic survey.

With regard to claim 25, Ray discloses that the source array comprises a first source and a second source disposed below the first source (Figs. 2, 5-7) (Column 5, Lines 59-65).

With regard to claim 26, Ray discloses that the second source is vertically below the first source (Column 4, Lines 5-31; Column 5, Lines 59-65; Column 7, Lines 15-45) (Figs. 2, 5-7).

With regard to claim 27, Ray discloses a means for actuating the second source at a predetermined time after the first source (Column 7, Lines 15-45).

With regard to claim 28, Ray discloses that the predetermined period of time is equal to the travel time of the seismic energy from the first source to the second source (Column 7, Lines 15-45).

With regard to claim 29, Ray discloses that the sources are disposed substantially at the surface of a water column (Column 5, Lines 59-65) (Figs. 2, 5-7).

With regard to claim 32, Robertsson discloses a storage medium comprising a program for a data processor (Page 16). It would have been obvious to modify Ray to include using a storage medium and processor as taught by Robertsson in order to have a way to process the seismic data obtained in the seismic survey after the activation of the sources.

With regard to claim 33, Robertsson discloses a storage medium containing a program for controlling the data processor (page 16). It would have been obvious to modify Ray to include using a storage medium and processor as taught by Robertsson

in order to have a way to process the seismic data obtained in the seismic survey after the activation of the sources.

Claims 16, 18, 30, and 31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ray in view of Robertsson as applied to claims 1-5, 7, 9, 11, 13-14, 20-29, and 32-33 above, and further in view of Lee (6606278).

With regard to claims 16 and 30, Haughland and Ray do not disclose that the source array comprises means for absorbing upwardly emitted seismic energy. Lee teaches a bubble diffuser that suppresses the upwardly emitted waves from reflecting at the surface (abstract; Column 2). It would have been obvious to modify Haughland or Ray to include the means for absorbing the upwardly emitted seismic energy as taught by Lee in order to remove the waves that cause the ghost reflections at the surface.

With regard to claims 18 and 31, Haughland and ray do not disclose that the source array comprises means for inducing positive reflection of upwardly emitted seismic energy. Lee teaches a bubble diffuser that provides high acoustic reflection off of air bubbles (abstract; Column 2). It would have been obvious to modify Haughland or Ray to include the means for inducing positive reflection of the upwardly emitted seismic energy as taught by Lee in order to remove the waves that cause the ghost reflections at the surface.

Conclusion

The cited prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Scott A. Hughes whose telephone number is 571-272-6983. The examiner can normally be reached on M-F 9:00am to 5:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jack Keith can be reached on (571) 272-6878. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



SAH



JACK KEITH
SUPERVISORY PATENT EXAMINER